

Knapp.

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FROM DR. KNAPP'S PRACTICE, REPORTED BY

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ALTHOUGH instances of central scotoma after exposure to sunlight are by no means rare, the subjoined case seems worthy of record, because of the persistence of the scotoma twelve years afterwards, and because of the presence of a peculiar hemiopic and rotating scotoma scintillans, which apparently was likewise the result of the action of the sun's rays.

The patient, P. W., a man twenty-four years of age, consulted Dr. Knapp on Feb. 5, 1895, and gave the following history: Twelve years previous he had, on the occasion of the transit of Venus,¹ looked directly at the sun through the tube formed by the nearly closed fist. Soon after, he found that when both eyes were open, but not when the left was closed, a greenish cloud hid completely the centre of every object looked at. This had exactly the shape of the illuminated portion of the sun at the time of the transit, *i. e.*, was a circle with a crescentic defect at the upper part corresponding to the spot occupied by the planet at the time. It was then of considerable size, covering an area 5 inches in width when projected upon a surface 15 or 20 inches off. Since then it has gradually decreased in size, but has always retained the same shape. It has always presented the characters of an absolute

¹ In 1882.



scotoma, and there has been no interference with color sensations, except that colored as well as white objects were completely blotted out within the area of obscuration. There has been no metamorphopsia.

Since the date of the transit he has also been subject to attacks in which the entire lower half of the field of vision of the right eye is blotted out, the area of obscuration being covered with dancing light and dark lines. This phenomenon is most distinctly apparent if the left eye is closed, and disappears altogether if the right eye is closed and the left remains open. In the course of ten or fifteen minutes the obscuration shifts its place so as to occupy successively the temporal, the superior, and lastly the nasal half of the visual field, and then disappears, being succeeded by a dull fronto-temporal left-sided headache lasting for about twelve hours. The obscuration is absolute, i. e., hides objects completely, and is bounded by a sharp line of demarcation, which is horizontal when the obscured area is situated above or below, and is vertical when this area is situated laterally. These attacks came on at first every four or five weeks, now only every three or four months.

Status præsens.—R E, V $\frac{2}{8}$ — (by slight indirect fixation), the letter which is looked at directly being partly cut off by the central spot of obscuration. L E, V $\frac{2}{8}$ —. Both eyes emmetropic. Field of vision, R E, presents precisely at point of fixation an absolute, positive scotoma, which at 1 metre distance has a diameter of 2.2 mm for white and blue, 2.4 mm for red, and 3.0 mm for yellow. Outside of these limits no defect in color-sense even by the most delicate tests. Careful examination with the ophthalmoscope, with the pupil dilated by homatropine, showed absolutely no abnormality in the optic disc or macula.

The first point of interest about this case is the length of time for which the scotoma had lasted. In most of the cases collected by MACKAY¹ in his elaborate review of the subject, the injury was comparatively recent (from two days to six months), in two the patient was examined one or two years afterward, and in one (Stigell's) the scotoma was alleged by the patient to exist as long as ten years afterward, although apparently no test was made by the physician to verify this statement.

¹ *Ophthalmic Review*, Nos. 1, 2, and 3, 1894.

The history of these cases, so far as they have been followed up, is that within a few hours of the time of exposure there is developed a positive, central or paracentral scotoma which varies very greatly in size but which soon begins to diminish both in size and density, until it either disappears altogether or, as in our case and in Stigell's, it is reduced to a very small, but permanent black spot.

The area of retina primarily affected is usually larger—sometimes, as in our case, enormously larger—than the retinal image of the sun. The latter subtends an angle of rather more than $\frac{1}{2}^{\circ}$, corresponding to a scotoma of 9 mm in diameter, at 1 metre. In one case, observed two days after the injury, the scotoma was of just this size, but in other cases during the first week it was from one and a half to two times this size. In the second week the area of retina affected was often reduced to one half or one third the size of the sun's image. After this, the reduction in size seems to take place more slowly. Thus a scotoma, which seventeen days after the injury was 3 mm in diameter, was, eighteen months later, about 2 mm. The largest scotoma hitherto recorded was in a case of Bock's¹ (= 100 mm at 1 metre, corresponding to a diameter of 6°); but the one in the case now under consideration must have originally been much larger still (20° to 25°).

In recent cases at least, the scotoma for colors appears to be greater than that for white, and a color-scotoma may persist after that for white has disappeared.² In our case no great disparity between the scotoma for colors and for white any longer exists; and, according to the patient, no such disparity ever existed.

Although neither microscopical observation upon man nor experimental research upon animals has thrown much light upon the pathological changes that underly these symptoms, it is evident from the clinical facts mentioned that these changes must affect that part of the retina upon which the sun's image is cast, and, in addition, a zone of very varying

¹ *Centralbl. f. Augenheilk.*, 1890, p. 291.

² Mackay, *loc. cit.*, Case IV.

dimensions surrounding and apparently concentric with this area. In the great majority of cases¹ the intensity of the lesion diminishes progressively from the centre to the periphery of the area affected, and, consequently, as the morbid process subsides, the peripheral portions regain their normal character first, so that the scotoma undergoes a concentric contraction. Indeed, so uniform is the latter, that in the few cases that have been observed accurately the scotoma is alleged to have retained pretty exactly its original shape, while all the time growing progressively smaller. In the present case, and in some others in which the scotoma was accurately mapped out,² the latter reproduced precisely the form of the non-obscured area of the sun; and it is a remarkable fact that it still retains this shape even when it has shrunk in size so far as to indicate that an area of retina of only one fourth the size of that originally occupied by the sun's image is involved.

One feature that is often present in cases of this sort, namely, metamorphopsia was absent in our case. On the other hand, the latter was complicated by a very peculiar kind of scotoma scintillans. True scintillating scotoma, with its associated migraine, has not, as far as I am aware, been reported in conjunction with these insolation injuries, and, while the patient was positive as to the fact that this kind of obscuration of sight had not existed previous to his accident, the connection between the two may well be doubted. Nevertheless, the scotoma merits attention not only on account of its possible etiology, but also because of its peculiar character. Occurring as a complete hemianopsia, which, by a process of slow rotation occupied all parts of the visual field in succession, it seems unique even among these curiously varied phenomena. Still more striking is the

¹ One of Deutschmann's cases (*Archiv f. Augenheilk.* vol. xxviii., part 3, p. 241) is a possible, though not a certain, exception.

² Cases IV. and VII. of Mackay's, and probably also one of Deutschmann's, and one of Sulzer's. The data upon this point in the other cases are too vague to be of service. When any are given, the scotoma is usually stated as oval. This oval figure very likely represents a diffusion-image of the more or less crescentic figure afforded by the partially eclipsed sun. At all events this seems to have been so in Mackay's first case, which was myopic, and in which the shape of the scotoma corresponds quite closely to that of the somewhat blurred image which a crescent would form upon the retina of such an eye.

fact that the hemianopsia is strictly uniocular, disappearing entirely when the left eye is shut. Uniocular hemianopsia is very uncommon, and uniocular scintillating scotoma so extremely rare as to be said by some authors not to exist; yet the patient's statements in this case seem to leave no doubt that the scintillation and hemianopsia actually affected but one eye, and that eye always the same.

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